12228 PCT / substitute sheets

## CLAIMS

1. A combined earth-star sensor system for three-axis attitude determination of satellites in space, with the combined earth-star sensor system (1) comprising separate apertures with different directions of observation and common image pickup devices (4) for the earth sensor and the star sensor, **characterised in that** the sensor system comprises means for variable control of the exposure time depending on the brightness of the earth and the stars to be observed.

2. The sensor system according to claim 1, **characterised in that** the earth-star sensor system (1) comprises a common optical arrangement (2) for earth observation and star observation, and a deflection mirror (3) for deviation of the laterally entering light from the earth, to the common optical arrangement (2).

3. The sensor system according to claim 1, **characterised in that** the earth-star sensor system (1) comprises an optical arrangement (9) for star observation, an optical arrangement (10) for earth observation and a semitranslucent beam splitter (8) for deviating the laterally entering light from the earth and transferring the starlight which enters in longitudinal direction, to the image pickup devices (4).

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4. The sensor system according to one of claims 1 to 3, **characterised in that** the aperture for the light from the earth is considerably smaller than the aperture for the starlight.

5. A method for simultaneous orbit determination and attitude determination of a space vehicle, characterised by the steps:

- Simultaneous imaging of stars and the rim of the earth in one focal plane of a sensor system;
- Determining the star attitude in the focal plane;
- Determining the rim of the earth by image processing;
- Determining the rates of rotation of the sensor system from the movement of the star image in the focal plane; and
- Calculating the orbit and/or attitude of a space vehicle carrying the sensor system,

characterised in that the exposure time or the integration time of the sensor system is alternatingly adapted to the difference in brightness of the stars and the earth.

6. The method according to claim 5, characterised in that the evaluation system of the sensor system by means of a star catalogue or similar prior knowledge disregards those areas in the image where the image of the rim of the earth and images of stars are superimposed, thus eliminating disturbing influences concerning the accuracy of determining the rim of the earth in the image.

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7. The method according to claim 5 or 6, further **characterised** by model-based tracking of the rim of the earth.

8. The method according to one of claims 5 to 7, **characterised in that** a long-wave fraction of the radiation is filtered out and used for determining the rim of the earth.

9. The method according to one of claims 5 to 8, **characterised in that** the rim of the earth is determined by fitting earth models.

ADD A37

Add B5

Add C1

Add C2